



**PendoTECH® Single Use UV Flow Cells and UV-VIS-NIR Photometer**

**Background**

In bioprocess operations, the UV absorbance of a liquid solution can identify the absence or presence of the molecule of interest. The measurement, typically at 280nm, is made by a spectrophotometer or photometer, either in-line or off-line in a cuvette. A collimated beam of light passes through a sample with a defined path length and the absorbance is determined as the ratio of the light applied from the source to what passed through the sample. The PendoTECH® Single Use UV Flow Cell and UV-VIS-NIR Photometer enables the measurement to be made non-invasively. The flow cells have compartments for inserting optical couplers to which the photometer's fiber optic cables are attached. The flow cells also contain special silica glass lenses to pass the photometer's light source through the sample and to the detector. The stream to be measured flows between the lenses by way of tubing attached to the hose-barb ends of the flow cell. The flow cell is low cost for single use applications and may be repeatedly cleaned and re-used. Additionally, reusable stainless steel flow cell options are available.



**Single Use UV Flow Cell Technical Details**

The flow cell is shown in the pictures below with the tubing and optical couplers installed as well as with the optional flow cell stand. There are multiple sizes available - including a 1/4inch hose barb with a 0.5cm path length, a 1/2inch hose barb with a 1cm path length, and a 1/8inch hose barb with a 2mm path length. The optical interface couplers are inserted into the flow cell's receptacles so the measurement can be made on the sample flowing through the cell. Optionally, the flow cell may be placed into PendoTECH's Flow Cell Stand with integral couplers. All polymeric materials in fluid path meet USP Class VI standards and are assembled in an ISO 13485 facility. The flow cell may be gamma and x-ray irradiated up to 50K Gy and also may be autoclaved up to 121°C .

There is no display or readout on the compact photometer because via its transmitter function, it is designed to be integrated to either a monitor with data acquisition capability or a control system. The raw output of the transmitter is a 4-20mA signal spanned to 0-3AUs. The standard wavelength is 280nm. Other wavelengths from 206-1000nm are available, but may not be interchanged by user.



Flow Cell Shown  
1/2inch hosebarb with  
1cm path length



Flow Cell Installed with Tubing



Optical Couplers Installed  
to Couplers in Cell



Flow Cell Installed in the  
Optional Stand



1/8inch hose barb  
2mm path length  
PART #: SPECPS-N-012



1/4inch hose barb  
0.5cm path length  
PART #: SPECPS-N-025

**COMING SOON!:**  
1/8inch hose barb  
0.5mm path length

## Photometer Models Available:

There are two models available, the benchtop and panel mount models.

### PANEL MOUNT

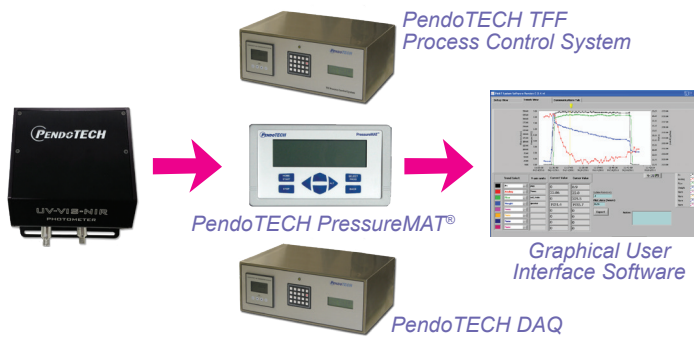
Screw Terminal Connector For:

- Power
- Baseline Tare
- mA Output
- Alarm



Removable flange for direct panel mounting and DIN rail mounting (w/ adapter plate)

The Photometer is designed to be integrated to a monitor with data acquisition capability. PendoTECH offers solutions for using the photometer such as PressureMAT® PLUS models (which can in turn be used with a PC for datalogging) and PendoTECH Process Control Systems. Other data acquisition devices with analog inputs may be used, as well as higher level control systems like PLCs and HMIs.



### BENCHTOP

For the mA output, there is a range of interface cables available.



Fiber Optic Connectors



Power Inlet      Baseline Blank Tare Button      4-20mA Output



## Also Available - Dual Wavelength Photometer!

Measuring the absorbance of two UV/VIS/NIR wavelengths in the same sample simultaneously has many advantages in biopharmaceutical development and manufacturing. PendoTECH is proud to offer its popular UV/VIS/NIR photometer in a two wavelength model. The PendoTECH Dual Wavelength UV/VIS/NIR photometer can be equipped with two LED light sources from 255 to 1000nm with a reading from each wavelength every second.



## Stainless Steel Flow Cell Options:

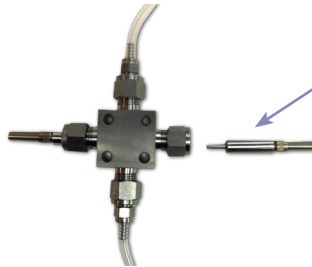
### PART #: SPEC-880-1CM

Shown with Micro couplers installed, different inlet/outlet options available, sanitary flange shown. Path length from 5mm to 10mm.

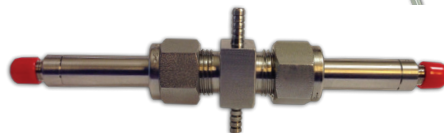


### PART #: SPECSS-N-ADJ-M

Nano coupler removed - with a micrometer included the path length can be adjusted without obstructing the fluid flow from 0.05 - 2mm.



### PART #: SPEC-880-1CMLH SPEC-880-5MMLH



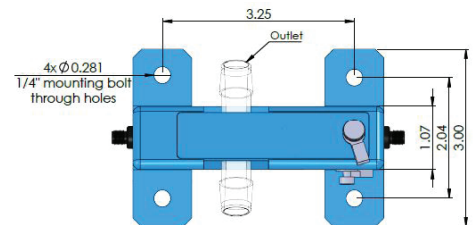
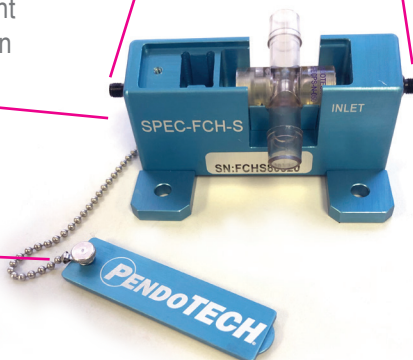
Low hold-up volume cell shown with 1/8 inch hosebarb inlet and outlet and micro coupler installed. Available with 1cm and 0.5cm path length.

## Flow Cell Stand Details:

Stand features a compartment to place light filters for photometer calibration verification

SMA905 connectors for connection of fiber optics

Removable cover with thumbwheel to secure to stand



Proper Orientation of Panel/Wall mount, vertical liquid travel, outlet above inlet

SPEC-FCH-S Panel Mounting (all dimensions in inches)

### PART #: SPEC-FCH-S

## UV/VIS/NIR Photometer Test Rig

The PendoTECH Photometer Test Rig and Standards (SPEC-280-TRS) is designed for quick and easy accuracy verification of PendoTECH's UV/VIS/NIR Photometers. The test kit includes one blank, and 5 NIST Traceable filters, a test rig for holding the filters and for connecting the photometer, and a convenient carrying case. See the datasheet for further details. (Click here for data sheet)



### PART #: SPEC-280-TRS

## Photometer Specifications:

Optical Configuration	LED light source
Optical Connectivity	SMA-905
Mechanical	4inch (10.2cm) W x 4inch (10.2cm) L x 2.5inch (6.4cm) H Weight: ~1.5lbs.
Power Requirement	24VDC nominal, 2.7W max power
Output	4-20mA (Active/sourcing) spanned 0-3AU
Analog Loop Resistance	500ohms at 24VDC
Operating Temperature	41 to 122°F (5 to 50°C)
Storage Temperature	-4 to 122°F (-20 to 50°C)
Measurement Range	0.000-3.00AU
Response Time	1 second

Maximum Zero Shift	±0.1% full scale (±0.002AU)
Accuracy*	0-2AU ±1%FS (±0.03AU) ; 2-3AU ±2%FS (±0.06AU)
Long Term Output Drift	±0.1% full scale (±0.002AU)
Repeatability	±0.5% full scale (±0.015AU)
LED Lifetime	> 2 years
Available Wavelengths	206-1000nm
Diagnostic Output Signal	The UV/VIS/NIR photometer's indicator LED will glow <b>RED</b> , indicating an alarm condition. For panel mounted units, 2 dedicated alarm contact pins will close during the alarm. The alarm will go off if: <ol style="list-style-type: none"> <li>1 - The measurement detector is saturated at 100%</li> <li>2 - The reference detector is saturated at 100%</li> <li>3 - The reference light and dark signals are too close together</li> </ol>

\* Accuracy is dependent on system arrangement and proper tare

The Photometer's LED provides a specific wavelength (or wavelengths for dual channel models) range for measurement, selected to coincide with analyte-specific molecular absorbance. Shown below are three example LED spectrum profile graphs, for typical LED light source wavelengths 260/280/880nm (Figures 1-3).

### • CWL (Center Wavelength):

The wavelength of an optical source that is considered its' middle. The wavelength of the peak of the spectral density curve.

#### • Important:

If measurements are attempted on a shoulder/slope of the molecule's absorbance profile, the absorbance measurement can change dramatically over the span of a few nanometers. Absorbance may never saturate as a portion of the LED's output is outside of the molecule's absorbance profile. Minute Photometer unit-to-unit absorbance variations exist due to CWL tolerance.

### • FWHM (Full Width Half Maximum):

A measure of the range of light the LED generates. The width of an optical signal at half its maximum intensity.

#### • Important:

If the light source FWHM width is wider than the molecule's absorbance peak, that will produce false, low absorbance values.

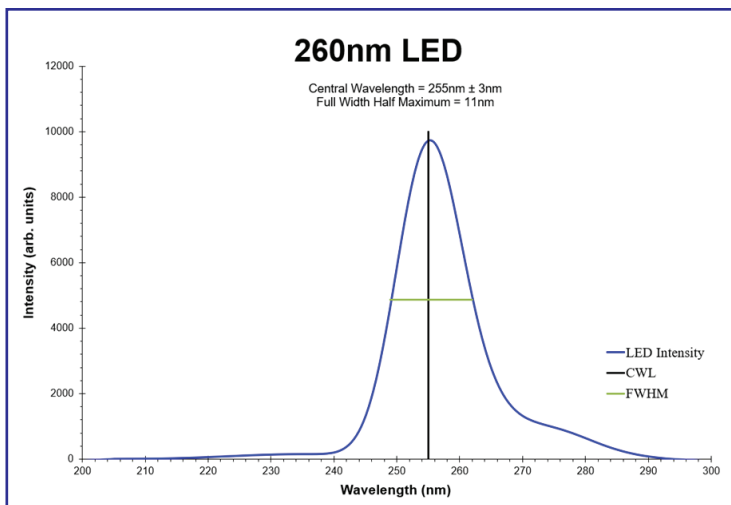


Figure 1 LED wavelength spectrum example for 260nm UV-VIS-NIR Photometer.

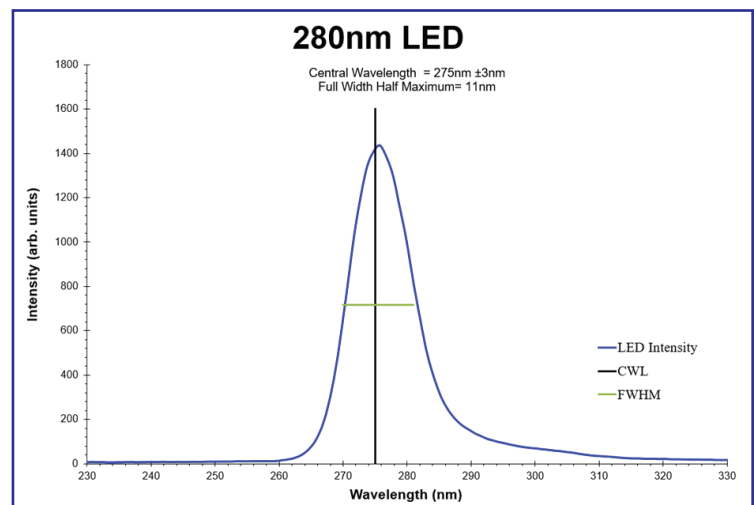


Figure 2 LED wavelength spectrum example for 280nm UV-VIS-NIR Photometer.

## Single Use Flow Cell Specifications:

Material	Polysulfone and fused silica with silicone O-ring
Pressure range	Rated for pressure up to 75psi (5bar)
Biocompatibility	All materials in contact with product fluid path meet USP Class VI requirements
Manufacturing Environment	FDA Registered, ISO 13485 certified facility; ISO 7 clean room
Gamma Irradiation	Up to 50 kiloGrays
X-ray Irradiation	Up to 50 kiloGrays
Operating temperature	2°C to 50°C (other ranges with process qualification)
Storage temperature	-25°C to 65°C
Shelf Life	5 years

### DIN Rail Adapter Mounting Plate

#### PART #: PHOTO-DR

The PendoTECH Photometer is available as a standalone bench top unit or in a panel mount model. When integrating the PendoTECH Photometer into an electrical cabinet there are several mounting options available (See Technical Note: PendoTECH Dual Wavelength Photometer Monitor/Transmitter Mounting Instructions). For mounting on a DIN rail installed in a cabinet there is a customized accessory available to streamline this process. It comes with the required hardware to mount the photometer:

- 4x #6 - 32 x 3/8inch Philips pan head machine screws
- 4x #6 - 32 Hex nuts



Spring loaded latch for easy removal



## Complete System Ordering Information

Generic PendoTECH Part #: SPEC-(L,P,N)-(1,2)-(SU,RU,SU1)-XXX-YYY	
Specify L or P	L = Lab P = Panel with flange on box base
Specify 1 or 2	1 = Single wavelength unit 2 = Dual wavelength unit
Specify SU, RU or SU1	SU = Optical couplers for use with single use flow cell RU = Optical couplers for use with reusable flow cell SU1 = Flow Cell Stand
Specify XXX and YYY (if applicable)	XXX = Wavelength # 1, i.e. 280nm YYY = Wavelength # 2, i.e. 880nm
For example, a panel mount, dual wavelength unit, measuring 280nm and 880nm with single use couplers would be ordered with the following part number: SPEC-P-1-SU-280	

*Each lab version photometer comes with a Universal Power Supply (with plug blades for country of use)*



Photometers	
SPEC-L-1-XXX-PHOTO	UV photometer w/XXXnm light source, 4-20mA output, benchtop model, with 24VDC supply. XXX = 280, 260 or other
SPEC-P-1-XXX-PHOTO	UV photometer w/XXXnm light source, 4-20mA output, panel model. XXX = 280, 260 or other
Single Use Flow Cells	
SPECPS-N-012	Single use UV flow cell, 2mm path length, non-sterile, polysulfone, 1/8inch hose barb
SPECPS-N-025	Single use UV flow cell, 0.5cm path length, non-sterile, polysulfone, 1/4inch hose barb
SPECPS-N-050	Single use UV flow cell, 1cm path length, non-sterile, polysulfone, 1/2inch hose barb
Couplers & Fiber Optic Cables	
SPEC-OC-SUT	One replacement optical coupler for single use flow cell
SPEC-FCH-S	Stand for PendoTECH single use flow cells, up to 1cm path length
SPEC-OC-FIBER	One replacement fiber optics cable (3ft / 1M)
SPEC-OC-FIBER-2M	One replacement fiber optics cable (6ft / 2M)
SPEC-OC-FIBER-3M	One replacement fiber optics cable (9ft / 3M)
SPEC-OC-FIBER-T	One replacement fiber optics cable with tether (3ft / 1m)
SPEC-OC-FIBER-2M-T	One replacement fiber optics cable with tether (6ft / 2m)
SPEC-OC-FIBER-3M-T	One replacement fiber optics cable with tether (9ft / 3m)
SPEC-OC-MICRO	One replacement micro optical coupler for stainless flow cell
SPEC-OC-PANEL	Panel mount SMA-905 connector (for pass through)
Stainless Steel Flow Cells	
SPEC-880-1CM	Absorbance flow cell, stainless steel with 1cm path length (with path length adjustable down to 0.5cm) - inlet / outlets must be specified (3/4inch sanitary flange, hose-barb in sizes: 1/8, 1/4, 3/8, 1/2inch)
SPEC-880-1CMLH	Low hold-up absorbance flow cell, stainless steel with 1cm path length, 0.75ml hold up. 1/8inch barb inlet / outlets
SPEC-880-5MMLH	Low hold-up absorbance flow cell, stainless steel with 0.5cm path length, 0.75ml hold up, 1/8inch barb inlet / outlets
SPECSS-N-ADJ-M	Stainless steel UV Flow Cell, with nano couplers 0.05 to 2mm path length; inlet/outlet fittings to be specified by user (3/4inch sanitary flange, hose-barb in sizes: 1/8, 1/4, 3/8, 1/2inch); fibers ordered separately

Accessories	
SPEC-280-TRS	Test rig for UV-VIS-NIR photometer
PMAT-DAQ	Analog display with 4 inputs with alarm inputs and serial port for data collection
PMAT-DAQ-A	Analog display with 4 inputs, 4 analog outputs, alarms, and serial port for data collection
PHOTO-DR	PendoTECH photometer DIN rail mounting kit, includes mounting plate and mounting hardware
PHOTO-PWR	PendoTECH photometer power supply with circular barrel connector, 24VDC, 0.75amp with plugs blades for destination

Interface Cables	
PDKT-UV1-PMAT	Cable from channel 1 of a single or dual channel photometer to PMAT analog input, 6ft
PDKT-UV1-PMAT-ENC	Cable from channel 1 of dual wavelength photometer to PMAT in stainless enclosures, PMAT analog input, 2m
PDKT-UV1-PCS	Cable from channel 1 of a single or dual channel photometer to PendoTECH PCS Control System (DAQ/TFF), mA, 6ft
PDKT-UV2-1-NFFSS	Cable from Channel 1 of a single or dual channel photometer to Filter Screening System Train 1, Analog 1 via 25 pin analog input connector
PDKT-UV2-FL	Cable from photometer to flying leads, 6ft

**NOTICE:** Each prospective user must test the sensor for its proposed application to determine its suitability for the purpose intended prior to incorporating the sensor to any process or application. The sensors are not intended for use as components in life support. The sensors are not designed for any application in which the failure of the product could result in personal injury or death or property damage. Proper safeguards must be put into place for the process in which the sensors are used.